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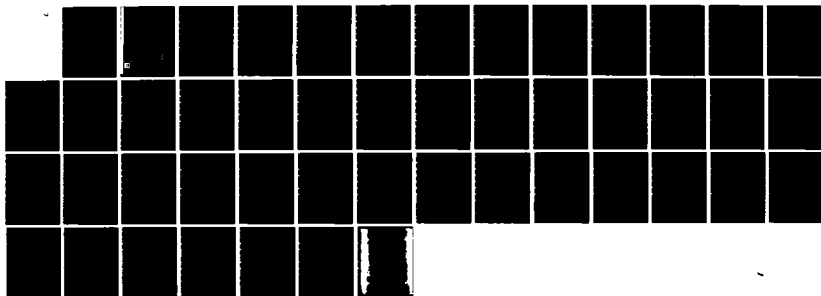
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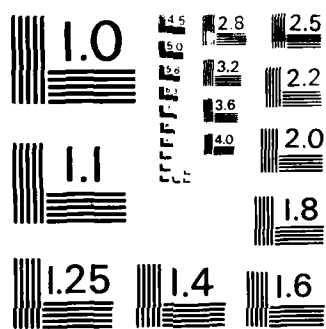
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NORDSEE RADAR BACKSCATTER MEASUREMENTS  
DATA REPORT

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THE UNIVERSITY OF KANSAS CENTER FOR RESEARCH, INC.

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NORDSEE RADAR BACKSCATTER MEASUREMENTS  
DATA REPORT

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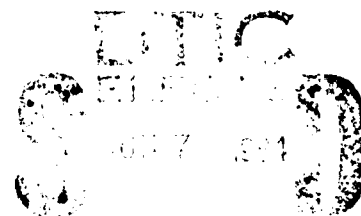
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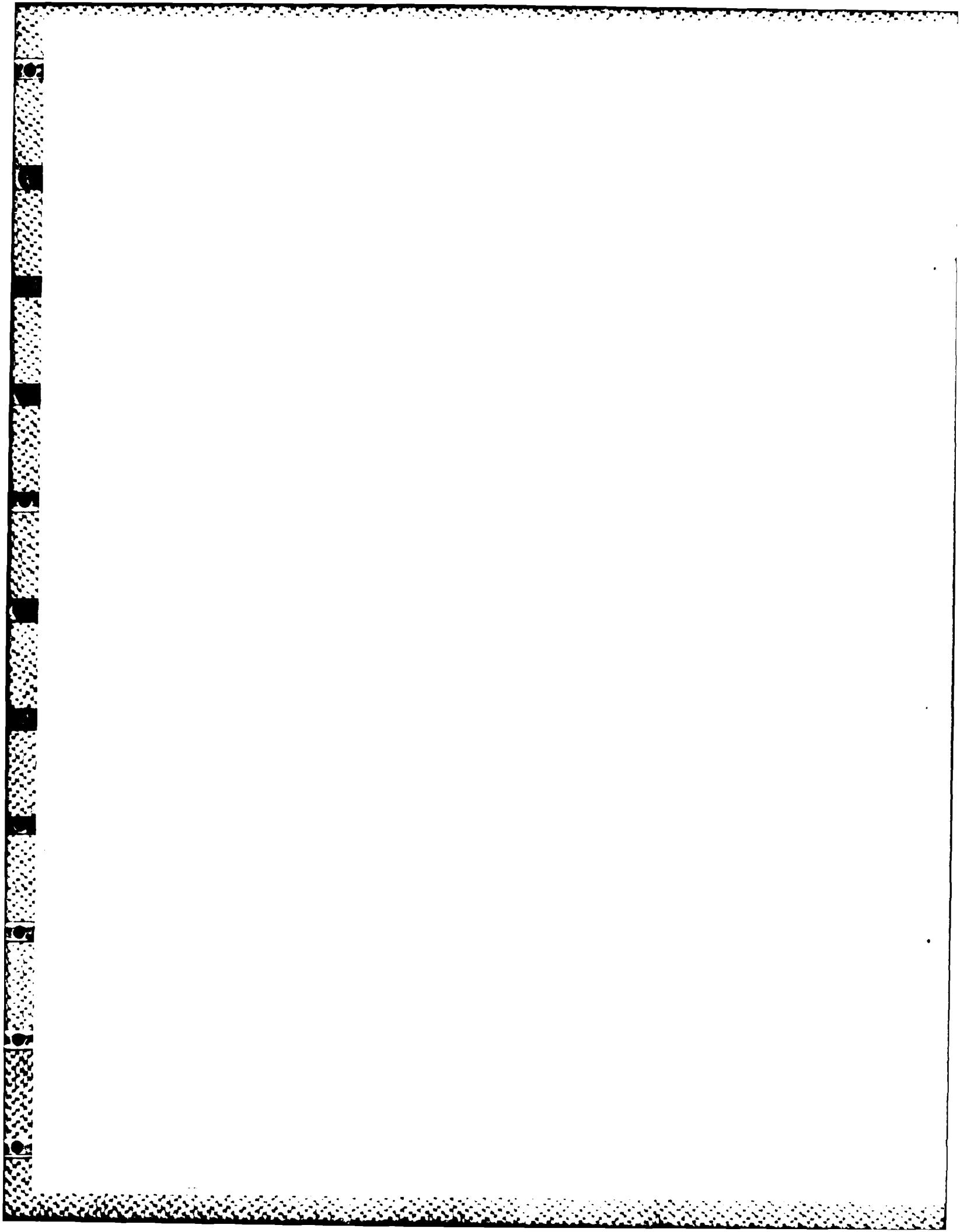


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# NORDSEE RADAR BACKSCATTER MEASUREMENTS DATA REPORT

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## ABSTRACT

This report summarizes the radar backscatter measurements of the ocean made by the University of Kansas from the Nordsee tower during the period from January 20 through February 3, 1984.

### 1.0 INTRODUCTION

→ Radar backscatter measurements of the ocean were made by University of Kansas (KU) investigators from the Nordsee tower to determine scattering coefficient as a function of wind speed, incidence angle and look direction at C-, X- and Ku-bands and to determine the modulation of Bragg-resonant ripples by long waves.

A modified version of the KU helicopter-borne scatterometer (HELOSCAT) was used to acquire the data. The radar backscatter data were collected at selected frequencies between 4 and 17 GHz, and incidence angles between 18° and 70° with VV- and HH-polarizations.

The purpose of this report is to summarize the data collected during the experiment. A brief description of the system used for these measurements is given in Section 2.0. Section 3.0 and Appendix I summarize the data. Appendix II is a reproduction of the data log.

## 2.0 SYSTEM DESCRIPTION

A modified version of HELOSCAT III was used to acquire the radar backscatter from the ocean during this experiment. The system was operated in the laboratories located on the lower deck of the Nordsee tower. The antenna mount was installed on the southeast corner of the lower deck. A microcomputer was used to sample different instruments and record the data on a digital cassette tape.

The relative calibration of the system was performed by measuring the signal from the delay line switched in place of the antenna. The absolute calibration was performed by measuring the power received from targets of known radar cross-section (a metal sphere of 20 cm diameter and a Luneberg lens were used during this experiment). The important specifications of the system used in this experiment are given in Table 1.

TABLE 1  
SYSTEM SPECIFICATIONS

|                              |   |
|------------------------------|---|
| Type                         | FM-CW   |
| Frequency Range              | 4-17 GHz                                      |
| FM Sweep                     | 750 MHz                                       |
| Transmitted Power            | 5-16 dBm                                      |
| Intermediate Frequency       | 50 kHz  |
| IF Bandwidth                 | 13.5 kHz                                      |
| Antenna:                     | Log-Periodic Reflector                        |
| Polarization                 | VV, HH  |
| Size                         | 61 cm   |
| Two-Way Effective Beamwidths | 5.2°, 2.8° and 2.0° at<br>5.3, 10, and 15 GHz |
| Incidence Angles             | 18° to 70° from vertical                      |
| Calibration:                 |   |
| Internal                     | Delay line                                    |
| External                     | Metal sphere and Luneberg lens                |
| Height                       | 24 meters                                     |



### 3.0 EXPERIMENT SUMMARY

Measurements of the radar backscatter from the ocean were made as part of the ESA C-band wind scatterometer campaign. Facilities and support were provided by German participants.

The primary emphasis in the data collection was to acquire long data runs at a fixed azimuth and incidence angle at 5.3, 10 and 15 GHz with VV-polarization. In addition, during aircraft overflights measurements were made at a fixed azimuth angle and the same incidence angles as that used by the equipment in the aircraft at 5.3 GHz with VV-polarization. The measurements were extended to other frequencies and HH-polarization as much as possible. Internal calibration of the system was performed before and after each data run.

A summary of each data run on a day-to-day basis is given in the tables in Appendix I. Also to be found in Appendix I are the total number of hours of data collected for up-, down-, and crosswind and the names of tapes which contain these data. The wind speed and directions given in the table are averages over an hour.

### 4.0 CONCLUSIONS

The radar system performed without any trouble during the experiment. A total of 140 hours of data has been collected out of which 65 hours are for upwind, 17 hours are for downwind, and 53 hours are for crosswind, the remaining 5 hours being for internal and external calibration. We believe the data collected will be useful in determining the scattering coefficient as a function of wind speed, incidence angle and look direction, and the modulation transfer function.

APPENDIX I

Total number of hours of data = 140

| <u>Wind Direction</u> | <u>No. of hours</u> | <u>Tapes</u>  |
|-----------------------|---------------------|---|
| Upwind                | 65                  | 4B, 5A, 5B, 6A, 8B, 9A, 10A, 10B,<br>11A, 11B, 12A, 12B, 13A, 13B, 14A,<br>14B, 15A, 16B, 17A, 17B, 18A, 18B,<br>19A, 20B, 21A, 21B, 22A, 22B, 24A,<br>24B, 25A, 25B, 26A, 26B, 27A |
| Downwind              | 17 hrs, 20 min.     | 1A, 1B, 2A, 2B, 3A, 3B, 4A, 7A, 7B, 8A  |
| Crosswind             | 53 hrs, 15 min.     | 6A, 6B, 7A, 8A, 8B, 9A, 9B, 15A, 15B,<br>16A, 16B, 19A, 19B, 20A, 20B, 21A,<br>22B, 23A, 23B, 24A   |

APPENDIX II  
Reproduction of Data Log

DATE: Jan 21, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIREC-TION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECT-ION (deg) |
|---------|---------|----------|-----|---------------------|-----------------|------------------|----------------|---------------|-------|--------------------|-----------------------|
|         |         |          |     |                     |                 |                  |                | Air           | Water |                    |                       |
| 210001  | 1A      | 5.3      | IC  |                     |                 | 17:41            | 18:00          | 0.2           | 3.1   | 17                 | 120                   |
| 210002  | 1A      | 5.3      | VV  | 45                  | D               |                  |                |               |       |                    |                       |
| 210003  | 1A      | 5.3      | IC  |                     |                 |                  |                |               |       |                    |                       |
| 210004  | 1A      | 10       | IC  |                     |                 | 19:00            | 19:27          | -0.6          | 3.1   | 17                 | 120                   |
| 210005  | 1A      | 10       | VV  | 45                  | D               |                  |                |               |       |                    |                       |
| 210006  | 1A      | 10       | IC  |                     |                 | 19:30            | 20:01          | -0.8          | 3.2   | 17                 | 120                   |
| 210007  | 1A      | 15       | IC  |                     |                 |                  |                |               |       |                    |                       |
| 210008  | 1A      | 15       | VV  | 45                  | D               |                  |                |               |       |                    |                       |
| 210009  | 1A      | 9-17     | IC  |                     |                 | 20:05            | 20:47          | -0.8          | 3.2   | 17                 | 120                   |
| 210010  | 1A      | 9-17     | VV  |                     |                 |                  |                |               |       |                    |                       |
| 210011  | 1A      | 45-77    | IC  |                     |                 | 21:10            | 23:00          | -0.3          | 3.6   | 19                 | 130                   |
| 210012  | 4B      | 45-77    | VV  | 45                  | D               |                  |                |               |       |                    |                       |

DATE: Jan 22, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                |
| 220401  | 2B      | 45-77    | IC  | .                   |                |                  |                |               |       |                    |                |
| 220402  | 2B      | 45-77    | VV  | 45                  | D              | 16:27            | 17:00          | -12           | 3.1   | 33                 | 130            |
| 220403  | 2B      | 45-77    | IC  |                     |                |                  |                |               |       |                    |                |
| 220404  | 3A      | 45-77    | VV  | 45                  | D              | 17:10            | 18:00          | -11           | 3.1   | 37                 | 120            |
| 220501  | 3A      | 9-17     | IC  |                     |                |                  |                |               |       |                    |                |
| 220601  | 3A      | 9-17     | VV  | 45                  | D              | 19:01            | 20:14          | -13           | 3.2   | 39                 | 120            |

DATE: Jan 23, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME<br>H : M | END TIME<br>H : M | TEMPERATURE<br>C |       | WIND SPEED<br>(Knots) | WIND DIRECTION<br>(deg) |
|---------|----------|----------|-----|---------------------|----------------|---------------------|-------------------|------------------|-------|-----------------------|-------------------------|
|         |          |          |     |                     |                |                     |                   | Air              | Water |                       |                         |
| 230001  | 3B       | 5.3      | IC  |                     |                | 9:20                | 10:00             | -18              | 3.3   | 27                    | 120                     |
| 230002  | 3B       | 5.3      | VV  | 55                  | D              |                     |                   |                  |       |                       |                         |
| 230003  | 3B       | 5.3      | IC  |                     |                | 10:40               | 11:14             | -2.9             | 3.2   | 27                    | 120                     |
| 230004  | 3B       | 10       | IC  | 55                  | D              |                     |                   |                  |       |                       |                         |
| 230005  | 3B       | 10       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 230006  | 3B       | 10.15    | IC  | 55                  | D              | 11:16               | 12:00             | -3.0             | 3.2   | 26                    | 120                     |
| 230007  | 3B       | 15       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 230008  | 3B       | 15       | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 230009  | 3B       | 5.3      | IC  |                     |                | 12:40               | 12:50             | -2.9             | 3.3   | 28                    | 110                     |
| 230010  | 3B       | 5.3      | VV  | 48                  | D              |                     |                   |                  |       |                       |                         |
| 230011  | 3B       | 5.3      | IC  |                     |                | 12:53               | 13:20             | -2.9             | 3.3   | 28                    | 120                     |
| 230012  | 4A       | 5.3      | VV  | 48                  | D              |                     |                   |                  |       |                       |                         |
| 230013  | 4A       | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 230014  | 4A       | 10       | IC  | 48                  | D              | 13:28               | 14:18             | -2.0             | 3.4   | 28                    | 120                     |
| 230015  | 4A       | 10       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 230016  | 4A       | 10       | IC  |                     |                | 14:15               | 15:00             | -2.8             | 3.6   | 27                    | 130                     |
| 230017  | 4A       | 10.15    | IC  | 48                  | D              |                     |                   |                  |       |                       |                         |
| 230018  | 4A       | 15       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 230019  | 4A       | 15       | IC  |                     |                | 16:45               | 17:15             | -3.1             | 3.6   | 29                    | 120                     |
| 230020  | 4B       | 5.3      | IC  | 45°                 | DU             |                     |                   |                  |       |                       |                         |
| 230021  | 4B       | 5.3      | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 230022  | 4B       | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 230023  | 4B       | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         |



DATE: Jan 24, 1964.

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (°) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|--------------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                    |
| 240403  | 6A      | 5.3      | IC  | 55                  | U              | 9:48             | 10:55          | 0.1           | 3.2   | 36                 | 80                 |
| 240404  | 6A      | 5.3      | VV  | 55                  | U              | 10:32            | 11:04          | 0.2           | 3.2   | 28                 | 70                 |
| 240501  | 6A      | 5.3      | VV  |                     |                |                  |                |               |       |                    |                    |
| 240502  | 6A      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                    |
| 240503  | 6A      | 10.15    | IC  | 55                  | U              | 11:07            | 11:19          | 0.2           | 3.2   | 27                 | 70                 |
| 240504  | 6A      | 10       | VV  |                     |                |                  |                |               |       |                    |                    |
| 240601  | 6A      | 10       | IC  |                     |                |                  |                |               |       |                    |                    |
| 240602  | 6A      | 15       | IC  |                     |                |                  |                |               |       |                    |                    |
| 240701  | 6A      | 15       | IC  | 55                  | C              | 12:50            | 13:36          | 0.6           | 3.1   | 26                 | 70                 |
| 240702  | 6A      | 15       | VV  |                     |                |                  |                |               |       |                    |                    |
| 240703  | 6B      | 15       | IC  |                     |                |                  |                |               |       |                    |                    |
| 240801  | 6B      | 5.3      | IC  | 45                  | C              | 13:52            | 14:17          | 0.9           | 3.2   | 25                 | 60                 |
| 240802  | 6B      | 5.3      | VV  |                     |                |                  |                |               |       |                    |                    |
| 240803  | 6B      | 5.3/10   | IC  | 45                  | C              | 14:19            | 14:30          | 0.95          | 3.1   | 24                 | 60                 |
| 240804  | 6B      | 10       | VV  |                     |                |                  |                |               |       |                    |                    |
| 240805  | 6B      | 10.15    | IC  | 45                  | C              | 14:39            | 15:22          | 1.0           | 3.1   | 23                 | 60                 |
| 240806  | 6B      | 15       | VV  |                     |                |                  |                |               |       |                    |                    |
| 240901  | 6B      | 5.3      | IC  | 65                  | C              | 15:30            | 16:00          | 1.05          | 3.1   | 22.5               | 55°                |
| 240902  | 6B      | 5.3      | VV  |                     |                |                  |                |               |       |                    |                    |
| 240903  | 6B      | 5.3/10   | IC  |                     |                |                  |                |               |       |                    |                    |
| 240904  | 6B      | 10       | VV  | 65                  | C              | 16:00            | 16:20          | 1.10          | 3.1   | 22.0               | 50                 |
| 240905  | 7A      | 10       | VV  | 65                  | C              | 16:21            | 17:05          | 1.10          | 3.1   | 22.0               | 50                 |
| 240906  | 7A      | 10.15    | IC  |                     |                |                  |                |               |       |                    |                    |
| 240907  | 7A      | 15       | VV  | 65                  | C              | 17:08            | 18:02          | 1.05          | 3.1   | 19.5               | 50                 |



DATE: Jan 24, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | Coast |                    |                      |
| 240907  | 7A      | 15       | VV  | 65                  | C              | 17:08            | 18:02          | 1.05          | 3.1   | 19.5               | 50                   |
| 240908  | 7A      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 240901  | 7A      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 240902  | 7A      | 5.3      | VV  | 65                  | D              | 19:09            | 19:42          | 1.10          | 3.3   | 15                 | 40                   |
| 241003  | 7B      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 241004  | 7B      | 5.3, 10  | IC  |                     |                |                  |                |               |       |                    |                      |
| 241005  | 7B      | 10       | VV  | 65                  | D              | 19:54            | 20:55          | 1.20          | 3.45  | 14.5               | 45                   |
| 241006  | 7B      | 10, 15   | IC  |                     |                |                  |                |               |       |                    |                      |
| 241007  | 7B      | 10       | VV  | 65                  | D              | 21:07            | 21:42          | 0.9           | 3.4   | 16.5               | 40                   |
| 241008  | 7B      | 10, 15   | IC  |                     |                |                  |                |               |       |                    |                      |
| 241009  | 7B      | 15       | VV  | 65                  | D              | 21:44            | 22:27          | 0.8           | 3.4   | 17                 | 40                   |

DATE: Jan 25, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | water |                    |                      |
| 250002  | 8A      | 5.3      | IC  |                     |                | 10:34            | 11:02          | 1.6           | 0.1   | 18                 | 360                  |
| 250003  | 8A      | 5.3      | VV  | 55                  | D              |                  |                |               |       |                    |                      |
| 250004  | 8A      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 250005  | 8A      | 10       | IC  |                     |                | 11:06            | 11:28          | 4.8           | 3.1   | 28                 | 360                  |
| 250006  | 8A      | 10       | VV  | 55                  | D              |                  |                |               |       |                    |                      |
| 250007  | 8A      | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250101  | 8A      | 15       | IC  |                     |                | 12:30            | 12:55          | 4.8           | 3.2   | 18                 | 340                  |
| 250102  | 8A      | 15       | VV  | 55                  | D              |                  |                |               |       |                    |                      |
| 250201  | 8A      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250301  | 8A      | 5.3      | IC  |                     |                | 13:28            | 13:58          | 4.9           | 3.4   | 14                 | 350                  |
| 250302  | 8A      | 5.3      | VV  | 55                  | C              |                  |                |               |       |                    |                      |
| 250401  | 8A      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 250402  | 8A      | 10       | IC  | 55                  | C              | 14:02            | 14:20          | 1.0           | 3.2   | 14                 | 350                  |
| 250403  | 8A      | 10       | VV  |                     |                |                  |                |               |       |                    |                      |
| 250404  | 8A      | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250405  | 8A      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250406  | 8B      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250407  | 8B      | 15       | VV  | 55                  | C              | 14:21            | 14:43          | 1.0           | 3.7   | 17                 | 350                  |
| 250408  | 8B      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |

DATE: Jan 25, 1984

IC: Interval calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME<br>H : M | END TIME<br>H : M | TEMPERATURE<br>C |       | WIND SPEED<br>(Knots) | WIND DIRECTION<br>(deg) |
|---------|----------|----------|-----|---------------------|----------------|---------------------|-------------------|------------------|-------|-----------------------|-------------------------|
|         |          |          |     |                     |                |                     |                   | Air              | Water |                       |                         |
| 250409  | 8B       | 5.3      | IC  | 55                  | U              | 15:41               | 16:11             | 1.5              | 3.7   | 16                    | 300                     |
| 250410  | 8B       | 5.3      | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 250411  | 8B       | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250412  | 8B       | 10       | IC  | 55                  | U              | 16:16               | 16:37             | 1.5              | 3.7   | 16                    | 300                     |
| 250413  | 8B       | 10       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 250414  | 8B       | 10       | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250415  | 8B       | 15       | IC  | 55                  | U              | 16:43               | 17:13             | 1.9              | 3.6   | 18                    | 310                     |
| 250416  | 8B       | 15       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 250417  | 8B       | 15.0     | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250501  | 8B       | 5.3      | IC  | 65                  | U              | 17:33               | 17:53             | 1.8              | 3.4   | 16                    | 310                     |
| 250502  | 8B       | 5.3      | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 250504  | 8B       | FE53     | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250505  | 9A       | 10       | IC  | 65                  | U              | 18:02               | 18:33             | 1.8              | 3.4   | 16                    | 310                     |
| 250506  | 9A       | 10       | VV  |                     |                |                     |                   |                  |       |                       |                         |
| 250507  | 9A       | 10       | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250508  | 9A       | 15       | IC  |                     |                |                     |                   |                  |       |                       |                         |
| 250509  | 9A       | 15       | VV  | 65                  | U              | 18:40               | 19:02             | 2.0              | 3.1   | 14                    | 320                     |
| 250600  | 9A       | 4.5      | IC  |                     |                |                     |                   |                  |       |                       |                         |



DATE: Jan 25, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 250701  | 90      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 250702  | 90      | 5.3      | VV  | 65                  | U              | 22:51            | 22:14          | 1.8           | 3.1   | 6                  | 270                  |
| 250703  | 90      | 5.3      | VV  | 65                  | U              | 22:15            | 22:18          | 1.8           | 3.1   | 6                  | 270                  |
| 250704  | 90      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 250705  | 90      | 10       | IC  |                     | U              | 22:19            | 22:38          | 1.8           | 3.0   | 5.5                | 260                  |
| 250706  | 90      | 10       | VV  | 65                  |                |                  |                |               |       |                    |                      |
| 250707  | 90      | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 250708  | 90      | 15       | IC  |                     | U              | 22:42            | 23:03          | 1.8           | 3.0   | 5.0                | 250                  |
| 250709  | 90      | 15       | VV  | 65                  |                |                  |                |               |       |                    |                      |
| 250710  | 90      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |

DATE: Jan 26, 1954

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 260001  | 98       | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 260002  | "        | "        | VV  | 45°                 | U              | 5:25             | 5:51           | 13            | 13.6  | 30                 |                      |
| 260003  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 260004  | 10A      | 10       | IC  |                     | U              | 5:58             | 7:29           | 13            | 13.2  | 27                 |                      |
| 260005  | "        | "        | VV  | 45°                 |                |                  |                |               |       |                    |                      |
| 260006  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 260007  | "        | 15       | IC  |                     | U              | 7:30             | 8:00           | 16            | 29    | 28                 |                      |
| 260008  | "        | "        | VV  | 45°                 |                |                  |                |               |       |                    |                      |
| 260009  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 260010  | "        | 45-7.7   | IC  |                     | U              | 8:10             | 10:40          | 16            | 27    | 24                 |                      |
| 260011  | "        | "        | VV  | 45°                 |                |                  |                |               |       |                    |                      |
| 260012  | "        | 40-17.0  | IC  |                     | U              | 10:46            | 11:16          | 16            | 27    | 26                 |                      |
| 260013  | "        | 90-17.0  | VV  | 45°                 |                |                  |                |               |       |                    |                      |
| 260014  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 260015  | 10B      | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 260016  | "        | "        | VV  | 55°                 | U              | 11:38            | 12:08          | 13            | 29    | 28                 |                      |
| 260017  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |



### IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

[illegible]







DATE: Jan. 27, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | Ar            | Water |                    |                      |
| 270914  | 13B      | 45-7.7   | HH  | 65°                 | U              | 17:09            | 17:55          | 1.7           | 4.1   | 32                 |                      |
| 270915  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271001  | "        | 40-18.0  |     |                     |                |                  |                |               |       |                    |                      |
| 271003  | "        | "        | HH  | 65°                 | U              | 19:07            | 19:53          | 2.2           | 4.2   | 14                 |                      |
| 271004  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271101  | "        | 50-5.3   | IC  |                     |                |                  |                |               |       |                    |                      |
| 271103  | "        | 5.3      | HH  | 55°                 | U              | 20:14            | 20:34          | 2.4           | 4.1   | 19                 |                      |
| 271104  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271105  | 14A      | 10       | IC  | 55°                 | U              | 20:42            | 21:14          | 2.3           | 4.1   | 18                 |                      |
| 271106  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 271107  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271109  | "        | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 271110  | "        | "        | HH  | 55°                 | U              | 21:18            | 21:49          | 2.3           | 4.1   | 17                 |                      |
| 271111  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271112  | "        | 45-7.7   | IC  |                     |                |                  |                |               |       |                    |                      |
| 271113  | "        | "        | HH  | 55°                 | U              | 21:56            | 22:42          | 2.3           | 4.1   | 18                 |                      |
| 271114  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 271115  | "        | 90-18.0  | HH  | 55°                 | U              | 22:40            | 23:00          | 2.1           | 4.2   | 10                 |                      |
| 271116  | "        | "        | HH  | 55°                 | U              |                  |                |               |       |                    |                      |

DATE: Jan 27, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHZ | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 271118  | 148      | 40-18.4  | HH  | 55°                 | U              | 23:06            | 13:37          | 2.1           | 4.2   | 17                 |                      |
| 271119  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |

DATE: Jan 28, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC (deg) | LOOK DIREC-TION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECT-ION (deg) |
|---------|----------|----------|-----|--------------------|-----------------|------------------|----------------|---------------|-------|--------------------|-----------------------|
|         |          |          |     |                    |                 |                  |                | Air           | Water |                    |                       |
| 280001  | 14B      | 5.3      | TC  | •                  |                 |                  |                |               |       |                    |                       |
| 280002  | "        | "        | HH  | 55°                | U               | 7:57             | 8:40           | 2.0           | 4.2   | 18                 |                       |
| 280001  | "        | "        | IC  |                    |                 |                  |                |               |       |                    |                       |
| 280102  | "        | "        | HH  | 55°                | U               | 8:51             | 9:27           | 2.4           | 4.2   | 17                 |                       |
| 280103  | "        | 5.3, 10  | IC  |                    |                 |                  |                |               |       |                    |                       |
| 280104  | "        | 10       | HH  | 55°                | U               | 9:31             | 9:53           | 2.3           | 4.2   | 16                 |                       |
| 280105  | 15A      | "        | IC  |                    |                 |                  |                |               |       |                    |                       |
| 280106  | "        | "        | HH  | 55°                | U               | 10:05            | 10:30          | 2.5           | 4.2   | 16                 |                       |
| 280107  | "        | "        | IC  |                    |                 |                  |                |               |       |                    |                       |
| 280201  | "        | 5.3      | IC  |                    |                 |                  |                |               |       |                    |                       |
| 280202  | "        | "        | VV  | 55°                | C               | 10:35            | 10:46          | 2.6           | 4.2   | 16                 |                       |
| 280203  | "        | "        | "   | 63°                | C               | 10:53            | 11:06          | 2.6           | 4.2   | 17                 |                       |
| 280204  | "        | "        | "   | 44°                | C               | 11:07            | 11:17          | 2.6           | 4.2   | 17                 |                       |
| 280205  | "        | "        | "   | 54°                | C               | 11:20            | 11:52          | 2.6           | 4.2   | 16                 |                       |
| 280206  | "        | "        | IC  |                    |                 |                  |                |               |       |                    |                       |

Average flight

DATE: Jan. 28, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME |       | END TIME | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------|-------|----------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                | H : M      | H : M |          | Air           | Water |                    |                      |
| 280301  | 15A      | 5.3      | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280302  | "        | "        | VV  | 55°                 | C              |            |       |          |               |       |                    |                      |
| 280303  | "        | "        | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280304  | "        | "        | VV  | 18°                 | C              |            |       |          |               |       |                    |                      |
| 280305  | 15B      | "        | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280306  | "        | "        | VV  | 18°                 | C              | 12:14      | 12:25 |          | 2.6           | 4.2   | 15                 |                      |
| 280307  | "        | "        | VV  | 26°                 | C              | 12:30      | 12:48 |          | 2.6           | 4.2   | 14                 |                      |
| 280308  | "        | "        | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280309  | "        | "        | VV  | 35°                 | C              | 12:49      | 13:07 |          | 2.6           | 4.2   | 14                 |                      |
| 280310  | "        | "        | "   | 45°                 | C              | 13:12      | 13:27 |          | 3.0           | 4.2   | 14                 |                      |
| 280311  | "        | "        | "   | 55°                 | C              | 13:31      | 13:45 |          | 3.2           | 4.2   | 13                 |                      |
| 280312  | "        | "        | "   | 65°                 | C              | 13:50      | 14:06 |          | 3.3           | 4.2   | 13                 |                      |
| 280313  | "        | "        | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280314  | "        | "        | VV  | 65°                 | C              | 14:07      | 14:28 |          | 3.2           | 4.2   | 13                 |                      |
| 280315  | "        | "        | VV  | 70°                 | C              | 14:30      | 14:45 |          | 3.2           | 4.2   | 14                 |                      |
| 280317  | 16A      | "        | IC  | •                   |                |            |       |          |               |       |                    |                      |
| 280318  | "        | "        | VV  | 73°                 | C              | 14:56      | 15:03 |          | 3.2           | 4.2   | 15                 |                      |

Aircor Air

DATE: Jan 26, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 280401  | 16A     | 10       | IC  | •                   |                | 15:38            | 15:49          | 3.1           | 4.2   | 15                 |                      |
| 280402  | "       | "        | VV  | 73°                 | C              |                  |                |               |       |                    |                      |
| 280403  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 280404  | "       | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 280405  | "       | "        | VV  | 73°                 | C              | 15:51            | 16:03          | 3.1           | 4.2   | 15                 |                      |
| 280406  | "       | 10       | VV  | 68°                 | C              | 16:10            | 16:20          | 3.1           | 4.2   | 15                 |                      |
| 280407  | "       | 15       | VV  | 68°                 | C              | 16:22            | 16:32          | 3.0           | 4.2   | 15                 |                      |
| 280408  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 280409  | "       | 10       | IC  | 57°                 | C              | 16:38            | 16:48          | 2.9           | 4.2   | 15                 |                      |
| 280410  | "       | 10       | VV  |                     |                |                  |                |               |       |                    |                      |
| 280411  | "       | 15       | VV  | 57°                 | C              | 16:49            | 16:59          | 2.8           | 4.2   | 15                 |                      |
| 280412  | "       | 10       | VV  | 45°                 | C              | 17:11            | 17:21          | 2.7           | 4.2   | 15                 |                      |
| 280413  | "       | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 280501  | "       | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 280502  | "       | "        | VV  | 45°                 | C              | 17:27            | 17:37          | 2.6           | 4.2   | 16                 |                      |

DATE: Jan. 28, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIREC-TION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|-----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                 |                  |                | air           | water |                    |                      |
| 280503  | 16A      | 15       | IC  | .                   |                 |                  |                |               |       |                    |                      |
| 280504  | "        | 10       | IC  |                     |                 |                  |                |               |       |                    |                      |
| 280505  | "        | "        | VV  | 35°                 | C               | 17:44            | 17:52          | 26            | 42    | 16                 |                      |
| 280506  | "        | 15       | VV  | 35°                 | C               | 17:53            | 18:00          | 24            | 42    | 16                 |                      |
| 280601  | "        | 10       | IC  |                     |                 |                  |                |               |       |                    |                      |
| 280602  | "        | "        | VV  | 25°                 | C               | 19:44            | 19:52          | 26            | 42    | 17                 |                      |
| 280603  | "        | 15       | IC  |                     |                 |                  |                |               |       |                    |                      |
| 280604  | "        | 15       | VV  | 25°                 | C               | 19:55            | ?              | 26            | 42    | 17                 |                      |
| 280605  | 16B      | 10       | IC  |                     |                 |                  |                |               |       |                    |                      |
| 280607  | "        | "        | VV  | 18°                 | C               | 20:17            | 20:26          | 28            | 42    | 17                 |                      |
| 280608  | "        | 15       | IC  |                     |                 |                  |                |               |       |                    |                      |
| 280609  | "        | "        | VV  | 14°                 | C               | 20:28            | 20:37          | 30            | 42    | 16                 |                      |





DATE: Jan 30, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME |       | END TIME |       | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------|-------|----------|-------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                | H : M      | H : M | H : M    | H : M | Air           | Water |                    |                      |
| 300002  | 17A      | 5.3      | IC  | •                   |                |            |       |          |       |               |       |                    |                      |
| 300003  | "        | "        | VV  | 55°                 | U              | 10:54      | 11:31 |          |       | 3.1           | 4.0   | 20                 |                      |
| 300004  | "        | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300005  | 17B      | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300006  | "        | "        | VV  | 55°                 | U              | 11:35      | 12:36 |          |       | 3.7           | 3.9   | 22                 |                      |
| 300007  | "        | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300008  | "        | 10       | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300009  | "        | "        | VV  | 55°                 | U              | 12:39      | 13:11 |          |       | 4.2           | 3.9   | 24                 |                      |
| 300010  | "        | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300011  | "        | 16       | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300012  | "        | 15       | VV  | 55°                 | U              | 13:14      | 13:48 |          |       | 4.2           | 3.9   | 22                 |                      |
| 300013  | 18A      | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300014  | "        | 5.3      | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300015  | "        | "        | HH  | 45°                 | U              | 14:10      | 14:40 |          |       | 4.2           | 4.0   | 24                 |                      |
| 300016  | "        | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300017  | "        | 10       | IC  |                     |                |            |       |          |       |               |       |                    |                      |
| 300018  | "        | "        | HH  | 45°                 | U              | 14:43      | 15:19 |          |       | 4.3           | 4.0   | 24                 |                      |
| 300019  | "        | "        | IC  |                     |                |            |       |          |       |               |       |                    |                      |

Boys in the water

DATE: Jan 30, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | air           | water |                    |                      |
| 300020  | 18A      | 15       | IC  | 45°                 | U              | 15:21            | 15:54          | 4.3           | 4.0   | 29                 |                      |
| 300021  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 300022  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 300023  | "        | 45-77    | IC  | 45°                 | U              | 15:58            | 16:24          | 4.4           | 4.0   | 29                 |                      |
| 300025  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 300027  | 18B      | "        | IC  | 45°                 | U              | 16:30            | 17:00          | 4.5           | 4.1   | 20                 |                      |
| 300028  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 300029  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 300030  | "        | 90-18.0  | IC  | 45°                 | U              | 17:11            | 17:58          | 4.6           | 4.1   | 19                 |                      |
| 300031  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 300032  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 3000201 | "        | 5.3      | IC  | 35°                 | U              | 19:10            | 19:22          | 4.7           | 4.1   | 20                 |                      |
| 3000202 | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 3000203 | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 3000204 | "        | 10       | IC  | 35°                 | U              | 19:23            | 19:54          | 4.6           | 4.1   | 20                 |                      |
| 3000205 | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 3000206 | "        | 15       | IC  | 35°                 | U              | 19:35            | 19:45          | 4.6           | 4.1   | 22                 |                      |
| 3000207 | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 3000208 | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |

DATE: Jan 30, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 300210  | 18B     | 5.3      | IC  | 25°                 | U              | 19:55            | 20:04          | 4.6           | 4.1   | 22                 |                      |
| 300211  | "       | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 300212  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 300214  | 19A     | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 300215  | "       | "        | HH  | 25°                 | U              | 20:09            | 20:20          | 4.6           | 4.1   | 22                 |                      |
| 300216  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 300217  | "       | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 300218  | "       | "        | HH  | 25°                 | U              | 20:22            | 20:33          | 4.6           | 4.0   | 23                 |                      |
| 300219  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |



DATE: Jan 31, 1984

IC: Interhal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIREC-TION | START TIME H : M |  | END TIME H : M |  | TEMPERATURE C |     | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|-----------------|------------------|--|----------------|--|---------------|-----|--------------------|----------------------|
|         |         |          |     |                     |                 |                  |  |                |  | Az            | Uz  |                    |                      |
| 31001   | 20A     | 5.3      | IC  | 18°                 | C               | 10:48            |  | 11:20          |  | 3.7           | 3.9 | 30                 | Arrow 180 deg        |
| 310101  | "       | "        | VV  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310102  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310103  | "       | "        | VV  | 25°                 | C               | 11:28            |  | 11:57          |  | 3.7           | 3.9 | 30                 | "                    |
| 310104  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310105  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310106  | "       | "        | VV  | 35°                 | C               | 12:00            |  | 12:25          |  | 3.7           | 3.9 | 37                 | "                    |
| 310107  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310108  | "       | "        | VV  | 45°                 | C               | 12:34            |  | 13:06          |  | 3.6           | 3.9 | 357                | "                    |
| 310109  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310110  | "       | "        | VV  | 55°                 | C               | 13:07            |  | 13:13          |  | 3.6           | 3.9 | 37                 | "                    |
| 310111  | 20B     | "        | VV  | 55°                 | C               | 13:15            |  | 13:44          |  | 3.8           | 3.9 | 37                 | Arrow 180 deg        |
| 310112  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310113  | "       | "        | VV  | 64°                 | C               | 13:46            |  | 13:58          |  | 4.1           | 3.9 | 32                 |                      |
| 310114  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310115  | "       | "        | VV  | 72°                 | C               | 13:59            |  | 14:12          |  | 4.1           | 3.9 | 30                 |                      |
| 310116  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310117  | "       | "        | IC  |                     |                 |                  |  |                |  |               |     |                    |                      |
| 310118  | "       | "        | VV  | 25°                 | C               | 14:21            |  | 14:33          |  | 4.4           | 3.9 | 30                 |                      |

DATE: Jan 31, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO                             | FREQ GHz | POL | ANGLE OF INC (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|-------------------------------------|----------|-----|--------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |                                     |          |     |                    |                |                  |                | Air           | Water |                    |                      |
| 310119  | 208                                 | 5.3      | VV  | 18°                | C              | 14:31            | 14:45          | 4.6           | 3.9   | 26                 |                      |
| 310120  | "                                   | "        | IC  |                    |                |                  |                |               |       |                    |                      |
| 310121  | "                                   | "        | IC  |                    |                |                  |                |               |       |                    |                      |
| 310122  | "                                   | "        | VV  | 55°                | U              | 14:55            | 15:46          | 4.9           | 3.9   | 26                 |                      |
| 310123  | "                                   | "        | IC  |                    |                |                  |                |               |       |                    |                      |
| 310124  | 19A (Remaining portion of tape #19) | IC 10    | IC  |                    |                |                  |                |               |       |                    |                      |
| 310125  | 1100                                | 10       | VV  | 55°                | U              | 16:02            | 16:34          | 5.1           | 3.9   | 24                 |                      |
| 310126  | "                                   | 10       | VV  | 55°                | U              | 16:36            | ?              | 4.9           | 3.9   | 24                 |                      |
| 310127  | "                                   | 15       | IC  | 55°                |                |                  |                |               |       |                    |                      |
| 310128  | "                                   | 5.3      | IC  | 55°                |                |                  |                |               |       |                    |                      |
| 310129  | "                                   | "        | HH  | 55°                |                | 17:42            | 17:50          | 5.0           | 3.8   | 25                 |                      |
| 310131  | "                                   | "        | IC  |                    |                |                  |                |               |       |                    |                      |
| 310132  | "                                   | 10       | HH  | 55°                |                | 17:54            | 18:21          | 5.0           | 3.8   | 25                 |                      |
| 310133  | 19B                                 | 15       | IC  | 55°                |                |                  |                |               |       |                    |                      |
| 310134  | "                                   | 15       | HH  | 55°                |                | 18:43            | 19:06          | 4.9           | 3.8   | 28                 |                      |
| 310135  | "                                   | 15       | IC  |                    |                |                  |                |               |       |                    |                      |
| 310201  | "                                   | "        | HH  | 134°55'            | C              | 19:43            | 20:25          | 4.9           | 3.8   | 31                 |                      |
| 310202  | "                                   | "        | HH  |                    |                |                  |                |               |       |                    |                      |

Boat in the water

DATE: Jan 31, 1964

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO. | FREQ GHZ | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 310203  | 19B      | 15       | IC  | •                   |                |                  |                |               |       |                    |                      |
| 310204  | "        | 5.3      | IC  | 45°                 | C              | 20:41            | 21:15          | 4.4           | 3.8   | 31                 |                      |
| 310205  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 310206  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 310207  | "        | 10       | IC  | 45°                 | C              | 21:17            | 21:41          | 4.6           | 3.8   | 30                 |                      |
| 310208  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 310209  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 310210  | "        | 15       | IC  | 45°                 | C              | 21:46            | 21:52          | 4.8           | 3.8   | 30                 |                      |
| 310211  | "        | "        | HH  |                     |                |                  |                |               |       |                    |                      |
| 310212  | 21A      | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 310213  | "        | "        | HH  | 45°                 | C              | 21:55            | 22:26          | 4.8           | 3.7   | 30                 |                      |
| 310214  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |



DATE: Feb 1, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO | FREQ GHZ | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME<br>H : M | END TIME<br>H : M | TEMPERATURE<br>C |       | WIND SPEED<br>(Knots) | WIND DIRECTION<br>(deg) |                     |
|---------|---------|----------|-----|---------------------|----------------|---------------------|-------------------|------------------|-------|-----------------------|-------------------------|---------------------|
|         |         |          |     |                     |                |                     |                   | A. 2             | 66721 |                       |                         |                     |
| 010002  | 21A     | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         | Altitude<br>(Knots) |
| 010003  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010004  | "       | "        | VV  | 18°                 | U              | 10:37               | 11:05             | 3.6              | 3.5   | 23                    |                         |                     |
| 010005  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010006  | "       | "        | VV  | 24°                 | U              | 11:10               | 11:36             | 3.1              | 3.5   | 23                    |                         |                     |
| 010007  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010008  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         | Altitude<br>(Knots) |
| 010009  | "       | "        | VV  | 55°                 | U              | 11:59               | 12:53             | 2.4              | 3.5   | 22                    |                         |                     |
| 010010  | 21B     | "        | VV  | 55°                 | U              | 12:55               | 15:23             | 2.0              | 3.5   | 20                    |                         |                     |
| 010011  | 22A     | "        | IC  | 55°                 | U              | 12:55               | 13:33             |                  |       |                       |                         |                     |
| 010013  | "       | 10       | IC  | 55°                 | U              | 15:28               | 15:52             | 1.7              | 3.6   | 16                    |                         |                     |
| 010014  | "       | "        | VV  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010015  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010016  | "       | 15       | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010017  | "       | "        | VV  | 55°                 | U              | 16:02               | 16:26             | 1.7              | 3.6   | 15                    |                         |                     |
| 010018  | "       | 5.3      | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010019  | "       | "        | VV  | 55°                 | U              | 16:29               | 17:08             | 2.0              | 3.6   | 20                    |                         |                     |
| 010020  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010021  | "       | "        | IC  |                     |                |                     |                   |                  |       |                       |                         |                     |
| 010022  | "       | "        | HH  | 55°                 | U              | 17:18               | 17:22             | 2.1              | 3.6   | 22                    |                         |                     |



DATE: Feb 1, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |         |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 010041  | 23A     | 53       | IC  |                     |                |                  |                |               |       |                    |                      |
| 010042  | "       | "        | HH  | 54°                 | C              | 21:06            | 21:26          | 0.7           | 3.7   | 30                 |                      |
| 010043  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 010044  | "       | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 010045  | "       | "        | HH  | 54°                 | C              | 21:28            | 22:10          | 0.6           | 3.5   | 31                 |                      |
| 010046  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 010047  | "       | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 010048  | "       | "        | HH  | 51°                 | C              | 22:28            | 23:00          | 1.1           | 3.5   | 31                 |                      |
| 010050  | "       | "        | IC  |                     |                |                  |                |               |       |                    |                      |

**IC: Internal calibration**

C: Cross wind, D: Down wind, U: Up wind

[illegible]

DATE: Feb 2, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: Up wind

| RUN NO. | TAPE NO | FREQ GHZ | POL | ANGLE OF INC (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |     | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|---------|----------|-----|--------------------|----------------|------------------|----------------|---------------|-----|--------------------|----------------------|
|         |         |          |     |                    |                |                  |                | Wet           | Dry |                    |                      |
| 020017  | 24A     | 5.3      | IC  | 55°                | U              | 11:35            | 12:52          | 3.2           | 3.6 | 28                 |                      |
| 020018  | "       | "        | VV  | 55°                |                |                  |                |               |     |                    |                      |
| 020019  | "       | "        | IC  |                    |                |                  |                |               |     |                    |                      |
| 020020  | "       | 10       | IC  |                    |                |                  |                |               |     |                    |                      |
| 020021  | "       | "        | VV  | 55°                | U              | 12:54            | 13:15          | 3.2           | 3.5 | 26                 |                      |
| 020023  | 24B     | "        | IC  |                    |                |                  |                |               |     |                    |                      |
| 020024  | "       | 15       | IC  |                    |                |                  |                |               |     |                    |                      |
| 020025  | "       | "        | VV  | 55°                | U              | 13:24            | 13:54          | 3.8           | 3.5 | 24                 |                      |
| 020026  | "       | "        | IC  |                    |                |                  |                |               |     |                    |                      |
| 020027  | "       | 5.3      | IC  |                    |                |                  |                |               |     |                    |                      |
| 020028  | "       | "        | VV  | 55°                | U              | 14:32            | 15:23          | 4.4           | 3.5 | 16                 |                      |
| 020029  | "       | "        | IC  |                    |                |                  |                |               |     |                    |                      |
| 020030  | "       | 5.3      | IC  |                    |                |                  |                |               |     |                    |                      |
| 020031  | "       | "        | HH  | 55°                | U              | 15:32            | 15:34          | 4.6           | 3.5 | 16                 |                      |
| 020032  | "       | 10       | IC  |                    |                |                  |                |               |     |                    |                      |
| 020033  | "       | 10       | HH  | 55°                | U              | 15:35            | 15:44          | 4.7           | 3.5 | 16                 |                      |
| 020034  | "       | 15       | IC  |                    |                |                  |                |               |     |                    |                      |

DATE: Feb 3, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIRECTION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (deg) |
|---------|----------|----------|-----|---------------------|----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                |                  |                | Air           | Water |                    |                      |
| 030215  | 240      | 10       | IC  | .                   |                |                  |                |               |       |                    |                      |
| 030216  | "        | 10       | HH  | 45°                 | U              | 01:55            | 01:04          | 44            | 3.5   | 16                 |                      |
| 030217  | "        | 15       | IC  |                     |                |                  |                |               |       |                    |                      |
| 030218  | "        | "        | HH  | 45°                 | U              | 01:08            | 01:23          | 44            | 3.5   | 16                 |                      |
| 030219  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 030220  | "        | "        | VV  | 45°                 | U              | 01:29            | 02:00          | 46            | 3.5   | 18                 |                      |
| 030221  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 030222  | "        | 10       | IC  |                     |                |                  |                |               |       |                    |                      |
| 030223  | "        | "        | VV  | 45°                 | U              | 01:02            | 02:37          | 46            | 3.5   | 17                 |                      |
| 030224  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |
| 030225  | "        | 5.3      | IC  |                     |                |                  |                |               |       |                    |                      |
| 030226  | "        | 5.3      | VV  | 45°                 | U              | 02:40            | 03:10          | 45            | 3.5   | 16                 |                      |
| 030227  | "        | "        | IC  |                     |                |                  |                |               |       |                    |                      |

DATE: Feb 2, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO. | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIREC-TION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (Knots) | WIND DIRECTION (any) |
|---------|----------|----------|-----|---------------------|-----------------|------------------|----------------|---------------|-------|--------------------|----------------------|
|         |          |          |     |                     |                 |                  |                | Air           | Water |                    |                      |
| 020101  | 24B      | 5.3      | IC  | 55°                 | U               | 16:23            | 16:56          | 4.8           | 3.5   | 19                 |                      |
| 020102  | "        | "        | VV  |                     |                 |                  |                |               |       |                    |                      |
| 020103  | "        | "        | IC  |                     |                 |                  |                |               |       |                    |                      |
| 020104  | "        | "        | IC  |                     |                 |                  |                |               |       |                    |                      |
| 020105  | 25A      | 9.0-18.0 | IC  | 55°                 | U               | 17:01            | 18:01          | 4.8           | 3.6   | 19                 |                      |
| 020106  | "        | "        | VV  |                     |                 |                  |                |               |       |                    |                      |
| 020107  | "        | "        | IC  |                     |                 |                  |                |               |       |                    |                      |
| 020201  | "        | 4.5-7.7  | IC  | 55°                 | U               | 18:38            | 19:44          | 4.7           | 3.6   | 21                 |                      |
| 020204  | "        | "        | VV  |                     |                 |                  |                |               |       |                    |                      |
| 020205  | 25B      | "        | IC  | 55°                 | U               | 19:57            | 22:05          | 4.8           | 3.6   | 16                 |                      |
| 020206  | "        | 5.3      | VV  |                     |                 |                  |                |               |       |                    |                      |
| 020207  | "        | "        | IC  |                     |                 |                  |                |               |       |                    |                      |
| 020208  | 26A      | 10       | IC  | 55°                 | U               | 22:05            | 23:28          | 4.5           | 3.5   | 19                 |                      |
| 020209  | "        | "        | VV  |                     |                 |                  |                |               |       |                    |                      |
| 020210  | "        | 10.15    | IC  | 55°                 | U               | 23:30            | 00:20 (663)    | 4.3           | 3.5   | 18                 |                      |
| 020211  | "        | 15       | VV  |                     |                 |                  |                |               |       |                    |                      |
| 030212  | 26B      | 15       | IC  | 55°                 | U               | 00:52            | 00:54          | 4.4           | 3.5   | 16                 |                      |
| 030213  | "        | 5.3      | IC  | 45°                 | U               |                  |                |               |       |                    |                      |
| 030214  | "        | "        | /// |                     |                 |                  |                |               |       |                    |                      |

Buynet Point

DATE: Feb 3, 1984

IC: Internal calibration

C: Cross wind, D: Down wind, U: up wind

| RUN NO. | TAPE NO | FREQ GHz | POL | ANGLE OF INC. (deg) | LOOK DIREC-TION | START TIME H : M | END TIME H : M | TEMPERATURE C |       | WIND SPEED (knots) | WIND DIRECT-ION (deg) |
|---------|---------|----------|-----|---------------------|-----------------|------------------|----------------|---------------|-------|--------------------|-----------------------|
|         |         |          |     |                     |                 |                  |                | Air           | Water |                    |                       |
| 030303  | 27A     | 5.3      | IC  | .                   | .               |                  |                |               |       |                    |                       |
| 030304  | "       | "        | VV  | 18°                 | U               | 9:41             | 10:43          | 44            | 34    | 24                 |                       |
| 030305  | "       | "        | LC  |                     |                 |                  |                |               |       |                    |                       |
| 030306  | "       | "        | VV  | 25°                 | U               | 10:45            | 11:14          | 44            | 34    | 26                 |                       |
| 030307  | "       | "        | IC  |                     |                 |                  |                |               |       |                    |                       |
| 030308  | "       | "        | VV  | 35°                 | U               | 11:17            | 11:45          | 41            | 34    | 25                 |                       |
| 030309  | "       | "        | IC  |                     |                 |                  |                |               |       |                    |                       |
| 030310  | "       | "        | VV  | 45°                 | U               | 11:48            | 12:03          | 41            | 34    | 24                 |                       |
| 030311  | "       | "        | IC  |                     |                 |                  |                |               |       |                    |                       |
| 030312  | "       | "        | VV  | 55°                 | U               | 12:06            | 13:12          | 35            | 34    | 30                 |                       |
| 030313  | "       | "        | IC  |                     |                 |                  |                |               |       |                    |                       |

Arrived 11:15



END

FILMED

7-84